

**I claim:**

1. A microparticle comprising alginate, a non-digestible polymer, a digestible polymer, and an emulsifier, wherein the alginate comprises from about 0.5 to about 1.5 percent by wet weight of the microparticle, the total polymer comprises from about 0.1 to about 5 percent by wet weight of the microparticle, the non-digestible polymer comprises from about 20 to about 80 percent by weight of the total polymer, the digestible polymer comprises from about 20 to about 80 percent by weight of the total polymer, and the emulsifier comprises a ratio to the non-digestible polymer from about 1:10 to about 10:1.
2. A microparticle as in claim 1, wherein the alginate comprises from about 0.5 to about 1.0 percent by weight of the microparticle.
3. A microparticle as in claim 2, wherein the alginate comprises about 1.0 percent by weight of the microparticle.
4. A microparticle as in claim 1, wherein the non-digestible polymer comprises from about 50 to about 80 percent by weight of the total polymer.
5. A microparticle as in claim 4, wherein the non-digestible polymer comprises about 80 percent by weight of the polymer.
6. A microparticle as in claim 1, wherein the digestible polymer comprises about 20 percent by weight of the total polymer.
7. A microparticle as in claim 1, wherein the total polymer comprises about 30 percent by weight digestible polymer and about 70 percent non-digestible polymer by total polymer weight.
8. A microparticle as in claim 1, wherein the digestible polymer comprises from about 20 to about 50 percent by weight of the total polymer.
9. A microparticle as in claim 1, wherein the emulsifier and non-digestible polymer are present in a ratio from about 1:5 to about 5:1.
10. A microparticle as in claim 9, wherein the emulsifier and non-digestible polymer are present in a ratio from about 1:2 to about 2:1.
11. A microparticle as in claim 10, wherein the emulsifier and non-digestible polymer are present in a ratio of about 2:1.

12. A microparticle as in claim 1, further comprising a bioactive agent or agents microbound by said microparticle.
13. A microparticle as in claim 1, wherein the non-digestible polymer is chosen from poly(vinylpyrrolidone), poly(vinylalcohol), poly(ethylene oxide), cellulose, cellulose derivatives, silicone, poly(hydroxyethylmethacrylate), starch, and amylose and the digestible polymer is chosen from amylopectin, waxy maize starch, soluble starch, gluten, casein, albumin, fishmeal, fish meal hydrolysate, krill meal, shrimp meal, soy meal, wheat meal, cotton seed meal, and pea meal.
14. A microparticle as in claim 12, wherein the bioactive agent or agents are chosen from microbes, proteins, peptides, nucleic acids, hormones, drugs, antibiotics, enzymes, minerals, vitamins, antibodies, immunogens, microstructures, and nanostructures.
15. A microparticle as in any of claims 1-14, wherein the microparticle is in a dry form.
16. A microparticle as in any of claims 1-14, wherein the microparticle is in a wet form.
17. A particle comprising alginate, a non-digestible polymer, a digestible polymer, and an emulsifier wherein, the alginate comprises from about 0.5 to about 1.5 percent by wet weight of the particle, the total polymer comprises from about 0.1 to about 5 percent by wet weight of the particle, the non-digestible polymer comprises from about 20 to about 80 percent by weight of the total polymer, the digestible polymer comprises from about 20 to about 80 percent by weight of the total polymer, and the emulsifier comprises a ratio to the non-digestible polymer from about 1:10 to about 10:1.
18. A particle as in claim 17, wherein the alginate comprises from about 0.5 to about 1.0 percent by weight.
19. A particle as in claim 18, wherein the alginate comprises about 1.0 percent by weight.
20. A particle as in claim 17, wherein the non-digestible polymer comprises from about 50 to about 80 percent by weight.

21. A particle as in claim 20, wherein the non-digestible polymer comprises about 80 percent by weight.
22. A particle as in claim 17, wherein the digestible polymer comprises about 20 percent by weight.
23. A particle as in claim 17, wherein the total polymer comprises about 30 percent by weight digestible polymer and about 70 percent by weight non-digestible polymer.
24. A particle as in claim 17, wherein the digestible polymer comprises from about 20 to about 50 percent by weight.
25. A particle as in claim 17, wherein the emulsifier and non-digestible polymer are present in a ratio from about 1:5 to about 5:1.
26. A particle as in claim 25, wherein the emulsifier and non-digestible polymer are present in a ratio from about 1:2 to about 2:1.
27. A particle as in claim 26, wherein the emulsifier and non-digestible polymer are present in a ratio of about 2:1.
28. A particle as in claim 17, further comprising a bioactive agent or agents microbound by said microparticle.
29. A particle as in claim 17, wherein the non-digestible polymer is chosen from poly(vinylpyrrolidone), poly(vinylalcohol), poly(ethylene oxide), cellulose, cellulose derivatives, silicone, poly(hydroxyethylmethacrylate), starch, and amylose.
30. A particle as in claim 28, wherein the bioactive agent or agents are chosen from microbes, proteins, peptides, nucleic acids, hormones, drugs, antibiotics, enzymes, minerals, vitamins, antibodies, immunogens, microstructures, and nanostructures.
31. A particle as in any of claims 17-30, wherein the particle is in a dry form.
32. A particle as in any of claims 17-30, wherein the particle is in a wet form.
33. A microparticle or particle as in either of claims 1 or 17, wherein the digestible polymer or polypeptide is chosen from amylopectin, waxy maize starch, soluble starch, gluten, casein, albumin, fish meal, fish meal hydrolysate, krill meal, shrimp meal, soy meal, wheat meal, cotton seed meal, and pea meal.

34. A particle as in claim 30, wherein the microbe is chosen from bacteria, yeast, viruses, *Bacillus* spp., *Bacillus licheniformis*, *Bacillus subtilis* strains commercially available from Chris Hansen's Biosystems, *Lactobacillus* spp., *L. bulgaricus*, *L. helveticus*, *L. plantarum*, *L. paracasei*, *L. casei*, *L. rhamnosus*, *Lactococcus* spp., *L. lactis*, *Alteromonas* spp., *A. media*, *Carnobacterium* spp., *C. divergens*, *Vibrio* spp., *V. alginolyticus*, *Pseudomonas* spp., *P. fluorescens*, *Streptococcus* spp., *S. lactis*, *S. thermophilus*, *Pseudoalteromonas* spp., *P. undina*, *Saccharomyces* spp., *S. cerevisiae*, *S. exiguus*, *Phaffia* spp., *P. rhodozoma*, *Pichia* spp., *P. pastoris*, *Kluyveromyces* spp., *K. aestuarii*, *K. marxianus*, and *K. yarrowii*.
35. A particle as in claim 30, wherein the protein is chosen from somatostatin, somatostatin derivatives, growth hormones, prolactin, adrenocorticotrophic hormone (ACTH), melanocyte stimulating hormone (MSH), thyroid hormone releasing hormone (TRH), TRH salts, TRH derivatives, thyroid stimulating hormone (TSH), luteinizing hormone (LH), oxytocin, calcitonin, gastrin, secretin, pancreozymin, cholecystokinin, interleukins, thymopoietin, thymosin, thymostimulin, thymic factors, bombesin, neurotensin, lysozyme, protein synthesis stimulating peptides, vasoactive intestinal polypeptide (VIP), growth hormone releasing factor (GRF), and somatocrinin.
36. A particle as in claim 30, wherein the bioactive agent is chosen from gentamicin, tetracycline, oxytetracycline, doxycycline, ampicillin, ticarcillin, cephalothin, cephaloridine, cefotiam, cefsulodin, cefmenoxime, cefmetazole, cefazolin, cefotaxime, cefoperazone, ceftizoxime, moxolactam, latamoxef, thienamycin, sulfazecin, and azthreonam.
37. A macroparticle comprising a starch hydrocolloid or polymeric protein bound by an alginate matrix comprising a microparticle as in any of claims 1-16.
38. A macroparticle comprising a starch hydrocolloid or polymeric protein bound by an alginate matrix comprising a particle as in any of claims 17-30.
39. A macroparticle as in either of claims 37 or 38, further comprising a bioactive agent which undergoes controlled release.
40. A macroparticle as in any of claims 37-39, further comprising one or more bioattractant.

41. A macroparticle as in any of claims 37-40, further comprising nutrients.
42. A feed, food, feed additive, or food additive comprising a microparticle comprising alginate, a non-digestible polymer, a digestible polymer, and an emulsifier, wherein the alginate comprises from about 0.5 to about 1.5 percent by wet weight of the microparticle, the total polymer comprises from about 0.1 to about 5 percent by wet weight of the microparticle, the non-digestible polymer comprises from about 20 to about 80 percent by weight of the total polymer, the digestible polymer comprises from about 20 to about 80 percent by weight of the total polymer, and the emulsifier comprises a ratio to the non-digestible polymer from about 1:10 to about 10:1.
43. A feed, food, feed additive, or food additive as in claim 42, wherein the alginate comprises from about 0.5 to about 1.0 percent by weight of the microparticle.
44. A feed, food, feed additive, or food additive comprising a particle as in claim 43, wherein the alginate comprises about 1.0 percent by weight of the microparticle.
45. A feed, food, feed additive, or food additive comprising a microparticle as in claim 43, wherein the non-digestible polymer comprises from about 50 to about 80 percent by weight of the polymer.
46. A feed, food, feed additive, or food additive comprising a microparticle as in claim 43, wherein the non-digestible polymer comprises about 80 percent by weight.
47. A feed, food, feed additive, or food additive comprising a microparticle as in claim 43, wherein the digestible polymer comprises from about 20 to about 50 percent by weight of the polymer.
48. A feed, food, feed additive, or food additive comprising a microparticle as in claim 43, wherein the digestible polymer comprises about 20 percent by weight of the polymer.
49. A feed, food, feed additive, or food additive comprising a microparticle as in claim 43, wherein the total polymer comprises about 30 percent by weight digestible polymer and about 70 percent non-digestible polymer by polymer weight.
50. A feed, food, feed additive, or food additive comprising a microparticle as in claim 43, wherein the emulsifier and non-digestible polymer are present in a ratio from about 1:5 to about 5:1.

51. A feed, food, feed additive, or food additive comprising a microparticle as in claim 50, wherein the emulsifier and non-digestible polymer are present in a ratio from about 1:2 to about 2:1.
52. A feed, food, feed additive, or food additive as in claim 51, wherein the emulsifier and non-digestible polymer are present in a ratio of about 2:1.
53. A feed, food, feed additive, or food additive comprising a microparticle as in claim 42, wherein the feed, food, feed additive, or food additive is for aquatic animals.
54. A feed, food, feed additive, or food additive as in claim 42, wherein the aquatic animals are chosen from mollusks, fish, and shrimp.
55. A feed, food, feed additive, or food additive as in any of claims 43-54, further comprising a bioactive agent or agents.
56. A feed, food, feed additive, or food additive as in claim 55, wherein the bioactive agent or agents are chosen from microbes, proteins, peptides, nucleic acids, hormones, drugs, antibiotics, enzymes, minerals, vitamins, antibodies, immunogens, microstructures, and nanostructures.
57. A feed, food, feed additive, or food additive as in any of claims 43-56 wherein the feed, food, feed additive, or food additive is in a dry form.
58. A feed, food, feed additive, or food additive as in any of claims 43-56 wherein the feed, food, feed additive, or food additive is in a wet form.
59. A feed, food, feed additive, or food additive as in claim 58, wherein the feed, food, feed additive, or food additive is for aquatic animals.
60. A feed, food, feed additive, or food additive as in claim 59, wherein the aquatic animals are chosen from mollusks, fish, and shrimp.
61. A method for producing a microparticle or particle wherein alginate comprises from about 0.5 to 1.5 percent by wet weight, total polymer comprises from about 0.1 to about 5 percent by wet weight, non-digestible polymer comprises from about 20 to about 80 percent by weight of polymer, digestible polymer comprises from about 20 to about 80 percent by weight of polymer, and emulsifier comprises a ratio to the non-digestible polymer from about 1:10 to 10:1 alginate, comprising combining a non-

digestible polymer, a digestible polymer, and an emulsifier to form a particle ranging in size from about 1 to about 5000  $\mu\text{m}$ .

62. A method as in claim 61, wherein the non-digestible polymer is solubilized in the presence of the emulsifier then brought to about room temperature prior to forming the microparticle.

63. A method as in claim 61, wherein the particles are used as a feed, food, food additive, or feed additive.

64. A method as in claim 64, wherein a macroparticle of any of claims 37-41 comprises one or more microparticle.

65. A method as in claim 64, wherein the macroparticle further comprises a bioactive agent or agents.

66. A method as in claim 65 wherein the bioactive agent is chosen from microbes, proteins, peptides, nucleic acids, hormones, drugs, antibiotics, enzymes, minerals, vitamins, drugs, antibodies, immunogens, microstructures, and nanostructures.

67. A method as in any of claims 61-66 wherein the microparticle or particle is used in a dry form.

68. A method as in any of claims 61-66, wherein the microparticle or particle is used in a wet form.

69. A method as in any of claims 61-68, wherein the microparticle or particle is used for aquatic animals.

70. A method as in claim 69, wherein the aquatic animals are chosen from rotifers, *Artemia*, mollusks, fish, and shrimp.

71. A method of delivery of a bioactive agent or agents comprising providing a microparticle as in any of claims 1-7, and delivering the agent to one or more organism.

72. A method as in claim 71, wherein the bioactive agent is chosen from microbes, proteins, peptides, nucleic acids, hormones, drugs, antibiotics, enzymes, minerals, vitamins, antibodies, immunogens, microstructures, and nanostructures.

73. A method as in claim 72, wherein the microbe is chosen from bacteria, yeast, viruses, *Bacillus* spp., *Bacillus licheniformis*, *Bacillus subtilis* strains commercially available from Chris Hansen's Biosystems, *Lactobacillus* spp., *L. bulgaricus*, *L.*

*helveticus*, *L. plantarum*, *L. paracasei*, *L. casei*, *L. rhamnosus*, *Lactococcus* spp., *L. lactis*, *Alteromonas* spp., *A. media*, *Carnobacterium* spp., *C. divergens*, *Vibrio* spp., *V. alginolyticus*, *Pseudomonas* spp., *P. fluorescens*, *Streptococcus* spp., *S. lactis*, *S. thermophilus*, *Pseudoalteromonas* spp., *P. undina*, *Saccharomyces* spp., *S. cerevisiae*, *S. exiguus*, *Phaffia* spp., *P. rhodozoma*, *Pichia* spp., *P. pastoris*, *Kluyveromyces* spp., *K. aestuarii*, *K. marxianus*, and *K. yarrowii*.

74. A method as in claim 71, wherein the protein is chosen from somatostatin, somatostatin derivatives, growth hormones, prolactin, adrenocorticotrophic hormone (ACTH), melanocyte stimulating hormone (MSH), thyroid hormone releasing hormone (TRH), TRH salts, TRH derivatives, thyroid stimulating hormone (TSH), luteinizing hormone (LH), oxytocin, calcitonin, gastrin, secretin, pancreozymin, cholecystokinin, interleukins, thymopoietin, thymosin, thymostimulin, thymic factors, bombesin, neurotensin, lysozyme, protein synthesis stimulating peptides, vasoactive intestinal polypeptide (VIP), growth hormone releasing factor (GRF), and somatocrinin.

75. A method as in claim 71, wherein the bioactive agent is chosen from gentamicin, tetracycline, oxytetracycline, doxycycline, ampicillin, ticarcillin, cephalothin, cephaloridine, cefotiam, cefsulodin, cefmenoxime, cefmetazole, cefazolin, cefotaxime, cefoperazone, ceftizoxime, moxolactam, latamoxef, thienamycin, sulfazecin, and azthreonam.

76. A method as in claim 71, wherein the bioactive agent is delivered to aquatic animals.

77. A method as in claim 76, wherein the aquatic animals are chosen from rotifers, *Artemia*, mollusks, fish, and shrimp.

78. A method of delivery of a bioactive agent or agents comprising providing a macroparticle as in any of claims 37-41, and delivering the macroparticle to one or more organism.

79. A method as in claim 78, wherein the bioactive agent is chosen from microbes, proteins, peptides, nucleic acids, hormones, drugs, antibiotics, enzymes, minerals, vitamins, antibodies, and nanostructures.



80. A method as in claim 79, wherein the microbes are chosen from bacteria, yeast, viruses, *Bacillus* spp., *Bacillus licheniformis*, *Bacillus subtilis* strains commercially available from Chris Hansen's Biosystems, *Lactobacillus* spp., *L. bulgaricus*, *L. helveticus*, *L. plantarum*, *L. paracasei*, *L. casei*, *L. rhamnosus*, *Lactococcus* spp., *L. lactis*, *Alteromonas* spp., *A. media*, *Carnobacterium* spp., *C. divergens*, *Vibrio* spp., *V. alginolyticus*, *Pseudomonas* spp., *P. fluorescens*, *Streptococcus* spp., *S. lactis*, *S. thermophilus*, *Pseudoalteromonas* spp., *P. undina*, *Saccharomyces* spp., *S. cerevisiae*, *S. exiguus*, *Phaffia* spp., *P. rhodozoma*, *Pichia* spp., *P. pastoris*, *Kluyveromyces* spp., *K. aestuarii*, *K. marxianus*, and *K. yarrowii*.

81. A method as in claim 79, wherein the protein is chosen from somatostatin, somatostatin derivatives, growth hormones, prolactin, adrenocorticotrophic hormone (ACTH), melanocyte stimulating hormone (MSH), thyroid hormone releasing hormone (TRH), TRH salts, TRH derivatives, thyroid stimulating hormone (TSH), luteinizing hormone (LH), oxytocin, calcitonin, gastrin, secretin, pancreozymin, cholecystokinin, interleukins, thymopoietin, thymosin, thymostimulin, thymic factors, bombesin, neurotensin, lysozyme, protein synthesis stimulating peptides, vasoactive intestinal polypeptide (VIP), growth hormone releasing factor (GRF), and somatocrinin.

82. A method as in claim 79, wherein the bioactive agent is chosen from gentamicin, tetracycline, oxytetracycline, doxycycline, ampicillin, ticarcillin, cephalothin, cephaloridine, cefotiam, cefsulodin, cefmenoxime, cefmetazole, cefazolin, cefotaxime, cefoperazone, ceftizoxime, moxolactam, latamoxef, thienamycin, sulfazecin, and azthreonam.

83. A method as in claim 79, wherein the bioactive agent is delivered to aquatic animals.

84. A method as in claim 83, wherein the aquatic animals are chosen from rotifers, *Artemia*, mollusks, fish, and shrimp.

85. A microparticle comprising alginate, a non-digestible polymer, a digestible polymer, an emulsifier, and one or more bioactive agent.

86. A particle comprising alginate, a non-digestible polymer, a digestible polymer, and an emulsifier.